

AMENDMENTS TO THE SPECIFICATION:

Please amend the paragraph beginning at page 2, line 26 as follows:

To take a simple similar example of an NP-hard Combinational Optimization Problem, let us assume that we have eleven jobs of various sizes that need to be shared, within a computer system, between five parallel processors. Each processor is capable of handling a single job of size 9, or any combination of smaller jobs having a total aggregate size of no more than 9.

Please amend the paragraph at page 3, beginning at line 4 as follows:

In this example, let us assume that the eleven jobs are defined by the set $W = \{2, 7, 5, 4, 3, 6, 2, 4, 2, 8, 1\}$ of 11 integers; using the above terminology, $n = 11$, ~~$m = 5$~~ , and $P = 9$; furthermore, we introduce a variable m which specifies the number of subsets to form; in the present case $m = 5$. The task, then, is ~~defined to define~~ define 5 groups of jobs such that the sum of the values within each group is close to, but does not exceed, 9.

Please amend the paragraph at page 3, beginning at line 17 as follows:

With this solution, four of the processors have an aggregate workload of 9, while the remaining processor (processor 4) has an aggregate work value of 8. Since all of these workloads are sufficiently close to but do not exceed the maximum value of 9, we

say that the *fitness value* of this possible solution is 5. Since that is the same as the number of processors, this solution is optimal.

Please amend the paragraph at page 4, beginning at line 10 as follows:

If the number of the global optima is greater than 1 in the solution space, then this problem is regarded as a combinatorial multimodal optimization problem.

Please amend the paragraph at page 5, beginning at line 5 as follows:

Several approaches have been proposed to deal with these problems, such as niching methods, fitness sharing, [Sareni, B and Krahenbuhl, L: Fitness Sharing and Niching Methods Revisited. *IEEE Transactions on Evolutionary Computation*. Vol. 2, No. 3, 1998] and parallel genetic algorithms Chipperfield A.J and Fleming, P.J: Parallel Genetic Algorithms: A Survey. Research Report No. 518, Department of Automatic Control and Systems Engineering, University of Sheffield, 1994]. Other techniques include those proposed by Sirinivas, M. and Patnaik. L.M: Adaptive Probabilities of Crossover and Mutation in Genetic Algorithms. *IEEE Transaction on Systems, Man and Cybernetics*. Vol. 24, No. 4, 1994; Schneider. G., Schuchhardt. J. and Wrede. P: Evolutionary Optimization in Multimodal Search Space. *Biological Cybernetics*. Vol. 74, No. 3, pp.203-207, 1996; Yao. X and Liu. Y: Fast evolution strategies. *Control and Cybernetics*. Vol.26, No. 3, pp.467-496, 1997; and Jelasity, M. and Dombi, J: GAS, a

Concept on Modelling Species in Genetic Algorithms. *Artificial Intelligence*, Vol. 99,
No. 1, pp. 1-19, 1998.

Please amend page 6, paragraph beginning at line 17:

The accompanying Figure 1 illustrates a flow chart of process steps in accordance
with an exemplary embodiment of this invention and Figures 2-3 illustrate exemplary
implementations of this exemplary embodiment.

The paragraph at page 13, line 21 should read as follows:

$$x <_p y \Leftrightarrow (\forall_i) (x_i \leq y_i) \wedge (\exists i) (x_i < y_i)$$

Please amend the paragraph at page 13, beginning at line 23 as follows:

Under these circumstances we say that vector x ~~dominates~~ is dominated by vector
 y . If a vector is not dominated by any other, we define it as *nondominated*.

Please amend the paragraph at page 13, beginning at line 26 as follows:

Turning back to the previous table, giving fitness vectors for the individuals $j_1, j_2,$
 j_3, j_4 , we can say that individual j_1 is dominated by both individual j_3 and j_4 , but
individual j_2 and j_3 are not dominated with each other. Individual ~~j_4~~ j_4 is not dominated by
any other individuals in the population: it is a *nondominated individual* in this
population.

Please amend the paragraph at page 14, beginning at line 5 as follows:

Different non-dominated individuals should be kept in the next generation after selection. Actually, most of these non-dominated individuals contain few schemata; they are inferior individuals with relatively smaller absolute fitness values, and might not continue to evolve. So these non-dominated individuals are ranked according to their absolute fitness value: non-dominated individuals with greatest absolute fitness value Ma so far are ranked as 'first class' individuals, and others with absolute fitness value $(Ma-k)$ (for positive integer $k=1, 2, \dots$; and $k \leq Ma$) are ranked as $(k+1)$ class individuals. The value of k is determined by the initial population size and the number of non-dominated individuals; the greater the value of k , the more genetic diversity will be preserved, and the more computation complexity will be required. In this case study, k is chosen as 1, which means that only ~~first class~~first and second class non-dominated individuals searched so far are guaranteed to be preserved in the next generation in order to maintain suitable genetic diversity and accelerate convergence speed.

Please amend page 18, paragraph beginning at line 1 as follows:

The method of the preferred embodiment may be implemented, without further inventive input, by a skilled computer programmer on the basis of the description given above. The algorithm may be conveniently implemented (in a conventional computer system 200 that has been suitably programmed as depicted in Figure 2) along the lines of the following pseudocode:

Please add the following at page 18, after line 20:

As depicted in Figure 3, a system comprising a plurality of devices 1-n are connected together to form a network, wherein each device has an associated constraint on the amount of tasks that it can perform per unit of time. The system includes 300 (e.g., the computer system 200 of Figure 2) for allocating a plurality of tasks among the devices. The allocation means includes (e.g., as defined by computer program code):

means A for generating a plurality of trial solution allocations to form an initial population of allocations;

means B for calculating for each allocation a fitness vector indicative of whether the constraint condition for each device has been satisfied;

means C for selecting a plurality of allocations for inclusion in the next generation of allocations in dependence upon their respective fitness vectors;

means D for creating the next generation of allocations by including the allocations selected by means C together with new allocations each of which is formed from a combination of two or more of the allocations selected by means C;

means E for repeating operation of means B to D until the population stabilizes; and

means F for allocating the tasks among the devices according to one of the allocations included in the stabilized population.